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Indian Standard

INDEXABLE HARDMETAL (CARBIDE) INSERTS WITH ROUNDED CORNERS WITH PARTLY CYLINDRICAL FIXING HOLE — DIMENSIONS OF INSERTS WITH 7° NORMAL CLEARANCE FOR LIGHT ALLOY AND PLASTIC COMPONENTS TURNING

ICS 25.100.01

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NEW DELHI 110002

August 2002

Price Group 4

Single Point Cutting Tools, Carbide Tips and Indexable Inserts Sectional Committee, BP 12

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Single Point Cutting Tools, Carbide Tips and Indexable Inserts Sectional Committee had been approved by the Basic and Production Engineering Division Council.

This is the first Indian Standard for carbide inserts for machining of high alloy non-ferrous metals and plastic components.

These inserts are primarily intended to be mounted on turning and boring tools by a countersunk head screw or any other fixing element. These inserts are used for turning light alloy materials (non-ferrous materials, such as aluminium, copper, brass, bronze) and plastic.

In the preparation of this standard, considerable assistance has been drawn from the manufacturing practices in India and at international level.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

INDEXABLE HARDMETAL (CARBIDE) INSERTS WITH ROUNDED CORNERS WITH PARTLY CYLINDRICAL FIXING HOLE — DIMENSIONS OF INSERTS WITH 7° NORMAL CLEARANCE FOR LIGHT ALLOY AND PLASTIC COMPONENTS TURNING

1 SCOPE

This standard specifies the dimensions of indexable hardmetal (carbide) inserts with rounded corners with partly cylindrical fixing hole.

Inserts dealt with in this standard, are standardized with chip breakers on the face.

2 REFERENCES

The following Indian Standards contain provisions which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

IS No.	*Title*
2428 : 1999	Application of hard cutting materials for machining by chip removal — Designation of the main groups of chip removal and groups of applications (*first revision*)
9897 : 2001	Indexable inserts for cutting tools — Designation (*second revision*)
12354 : 1988	Indexable carbide inserts with partly cylindrical fixation hole

3 TYPES OF INSERTS

a) TC : Triangular inserts with 7° normal clearance;

b) SC : Square inserts with 7° normal clearance;

c) CC : Rhombic inserts with 7° normal clearance and 80° included angle;

d) DC : Rhombic inserts with 7° normal clearance and 55° included angle;

e) VC : Rhombic inserts with 7° normal clearance and 35° included angle; and

f) RC : Round inserts with 7° normal clearance.

4 DIMENSIONS

The choice of the more common dimension is restricted to the specification given in Tables 1 to 6. It is strongly recommended that these standard inserts be used wherever possible.

5 TOLERANCES

5.1 Indexable hardmetal inserts are provided in tolerance class *G* according to IS 9897.

5.1.1 The values of the tolerances according to IS 9897 are given below:

Dimension	*Tolerance*
d, m, m_1 and m_2	± 0.025
s	± 0.13

5.1.2 Other tolerances are included in Table 7 for hole dimensions and in Tables 1 to 6 for insert dimensions.

5.2 Measurement

Annex A indicates the methods of measuring the dimension of the indexable inserts covered by this standard.

6 GENERAL REQUIREMENTS

6.1 Thickness of Inserts with Chip Breaker

The thickness s of inserts with chip breakers is defined as the distance between the cutting edge at the corner and the opposing supporting surface of the insert [*see* Fig. 1(a) and (b)].

6.2 Fixing Hole

In order to guarantee interchangeability when mounting the insert by a countersunk head screw having a head taper angle between 40° and 60°, the form of the hole is partly cylindrical and its dimensions are related to the diameter of the inscribed circle of the insert. Figure 2 and Table 7 give the elements of definition of the fixing hole.

The position of point P is given by diameter d_2 (Table 7), the distance t, measured from the cutting edge at the corner, and dimension c, measured from the upper face.

The ranges of dimensions t and c are as follows:

$0.05d_1 \leq t \leq 0.3d_1$

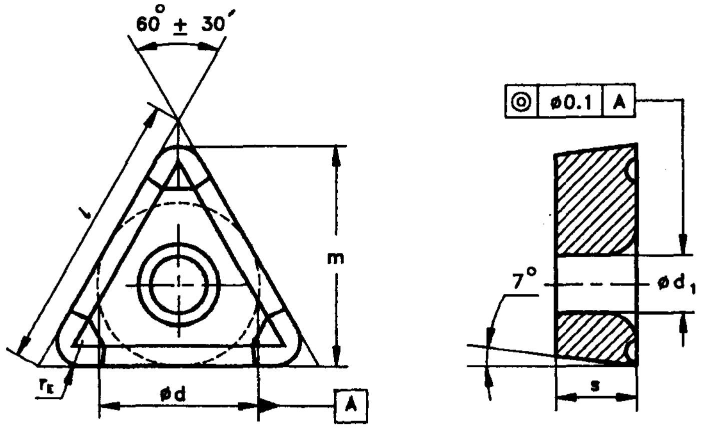
and

$0.015d_1 \leq c \leq 0.3d_1$

Table 1 Dimensions for Triangular Inserts with 7° Normal Clearance, Type TC

(*Clauses* 4 *and* 5.1.2)

All dimensions in millimetres.



TCGT
with chip breakers

Inserts	*l* ≈	*d*[1]	*s*[1]	*m*[1]	*r*ε ± 0.10	*d*₁ Js 13
TCGT 06T102	6.9	3.97	1.98	5.755	0.2	2.15
TCGT 06T104				5.556	0.4	
TCGT 090202	9.6	5.56	2.38	8.131	0.2	2.5
TCGT 090204				7.943	0.4	
TCGT 110202	11.0	6.35	2.38	9.322	0.2	2.8
TCGT 110204				9.128	0.4	
TCGT 16T302	16.5	9.525	3.97	14.089	0.2	4.4
TCGT 16T304				13.891	0.4	
TCGT 16T308				13.494	0.8	

[1] Tolerance on *d*, *s* and *m* according to IS 9897 (*see* **5.1.1**).

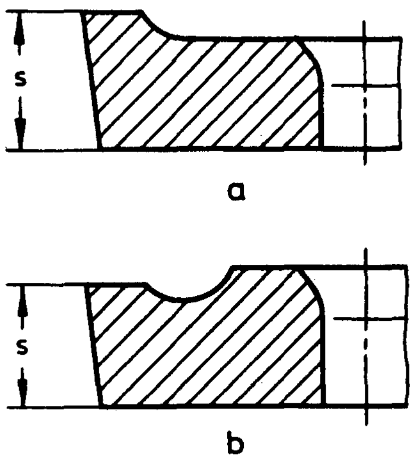


FIG. 1 THICKNESS OF INSERTS WITH CHIP BREAKERS

These dimensions take into account three cases: indexable inserts with upper faces below the cutting edges [Fig. 2(a)]; with upper faces on the same level as the cutting edges [Fig. 2(b)]; with upper faces above the cutting edges [Fig. 2(c)].

The dimensions of *t* and *c* shall be satisfied in all three cases.

The diameter d_1 of the cylindrical part of the hole is given in Tables 1 to 7.

The part of the profile between d_2 and *P* is left at the manufacturer's discretion but shall satisfy the following requirements:

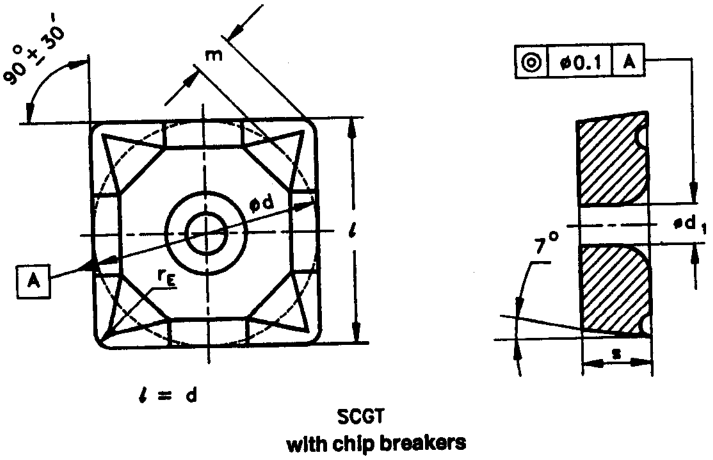
a) the use of screws with head taper angle β between 40° and 60° shall be possible;

b) the angle of the tangent theoretical taper at point *P* has the value $\varphi \geq 65°$; and

Table 2 Dimensions for Square Inserts with 7° Normal Clearance, Type SC

(*Clauses* 4 *and* 5.1.2)

All dimensions in millimetres.



SCGT
with chip breakers

Inserts	d[1]	s[1]	m[1]	r_ε ± 0.10	d_1 Js 13
SCGT 09T304	9.525	3.97	1.808	0.4	4.4
SCGT 09T308			1.644	0.8	
SCGT 120408	12.70	4.76	2.301	0.8	5.5

[1] Tolerance on *d*, *s* and *m* according to IS 9897 (*see* **5.1.1**).

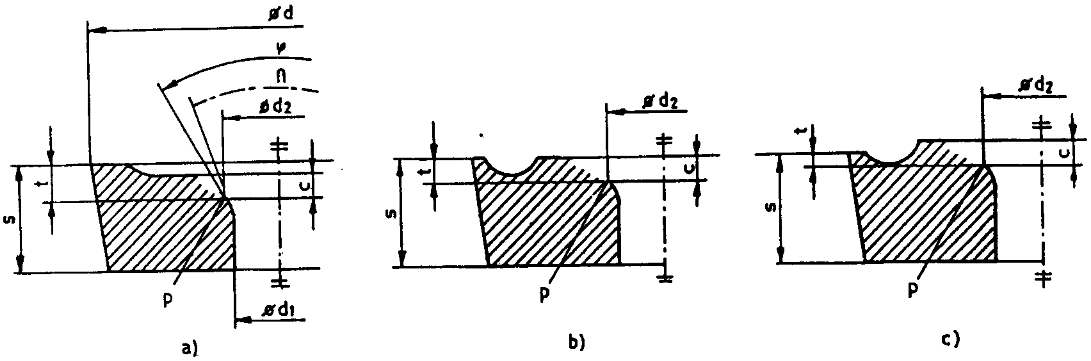
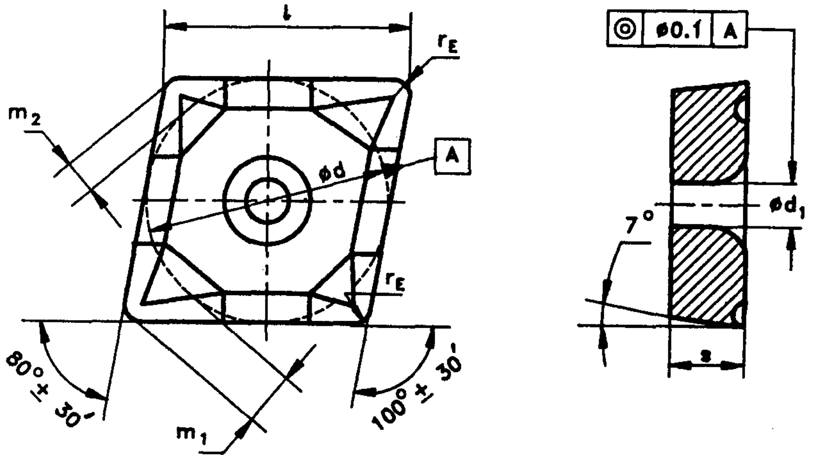


Fig. 2 Elements of Definition of Fixing Hole

Table 3 Dimensions for Rhombic Inserts with 7° Normal Clearance and 80° Included Angle Type CC

(*Clauses* 4 *and* 5.1.2)

All dimensions in millimetres.



CCGT
with chip breakers

Inserts	l ≈	d[1]	s[1]	m_1[1]	m_2[1]	r_ε ±0.10	d_1 Js 13
CCGT 060202	6.4	6.35	2.38	1.652	0.908	0.2	2.8
CCGT 060204				1.544	0.848	0.4	
CCGT 09T302	9.7	9.525	3.97	2.536	1.394	0.2	4.4
CCGT 09T304				2.426	1.333	0.4	
CCGT 09T308				2.206	1.212	0.8	
CCGT 120402	12.9	12.70	4.76	3.418	1.878	0.2	5.5
CCGT 120404				3.308	1.818	0.4	
CCGT 120408				3.088	1.697	0.8	

[1] Tolerance on d, s, m_1 and m_2 according to IS 9897 (*see* **5.1.1**).

c) the distance between the contact line with a screw having 40° head taper angle and the contact line with a screw having 60° head taper angle shall be as small as possible.

The part of the profile above point *P* is left at the manufacturer's discretion.

7 DESIGNATION

The designation of the indexable hardmetal inserts complying with this standard, shall conform to IS 9897.

In addition to this designation, one or both of the following may be indicated:

a) Symbol of the group of application according to IS 2428.

b) Commercial designation of the hardmetal grade.

8 MARKING

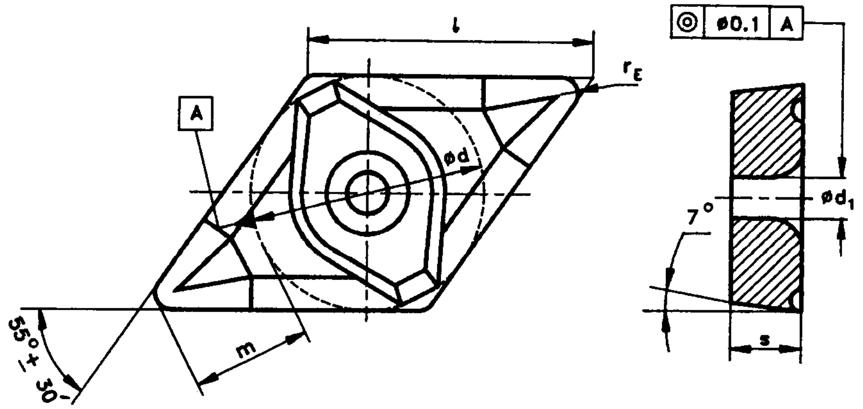
The following symbol, at least, shall be marked on the insert itself (except when this would be difficult on the smaller inserts):

> The symbol of the group of application, or commercial designation of the hardmetal grade (or both, if possible, on large inserts).

Table 4 Dimensions for Rhombic Inserts with 7° Normal Clearance and 55° Included Angle, Type DC

(*Clauses* 4 *and* 5.1.2)

All dimensions in millimetres.



DCGT
with chip breakers

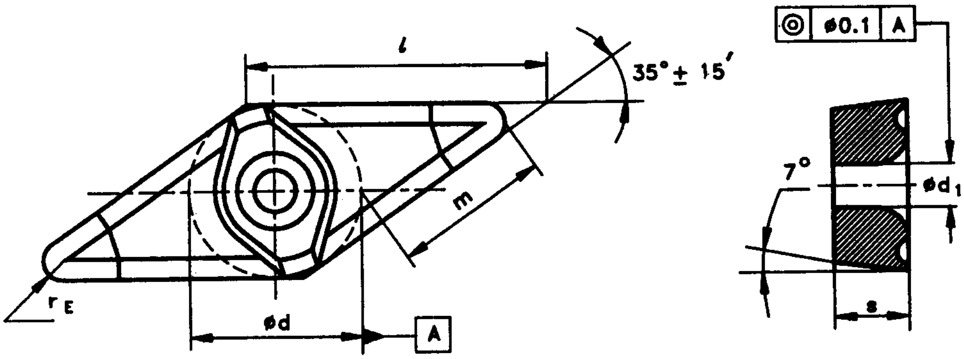
Inserts	l ≈	d1)	s1)	m1)	r_E ±0.10	d_1 Js 13
DCGT 070202	7.75	6.35	2.38	3.464	0.2	2.8
DCGT 070204				3.238	0.4	
DCGT 11T302	11.6	9.525	3.97	5.320	0.2	4.4
DCGT 11T304				5.089	0.4	
DCGT 11T308				4.626	0.8	

1) Tolerance on d, s and m according to IS 9897 (*see* 5.1.5).

Table 5 Dimensions for Rhombic Inserts with 7° Normal Clearance and 35° Included Angle, Type VC

(*Clauses* 4 *and* 5.1.2)

All dimensions in millimetres.



VCGT
with chip breakers

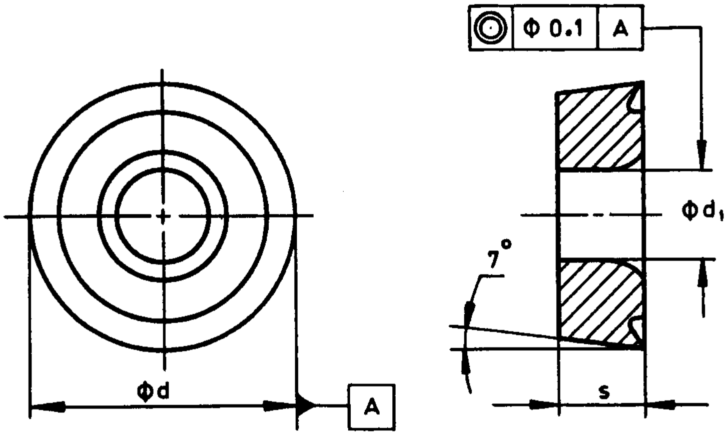
Inserts	l ≈	d 1)	s 1)	m 1)	r_ε ±0.10	d_1 Js 13
VCGT 110302	11.1	6.35	3.18	6.922	0.2	2.8
VCGT 110304				6.46	0.4	
VCGT 110308				5.537	0.8	
VCGT 160404	16.6	9.525	4.76	10.152	0.4	4.4
VCGT 160408				9.229	0.8	
VCGT 160412				8.306	1.2	
VCGT 220530	22.1	12.7	5.56	7.790	3.0	5.5

1) Tolerance on *d*, *s* and *m* according to IS 9897 (*see* **5.1.1**).

Table 6 Dimensions for Round Inserts with 7° Normal Clearance, Type RC

(*Clauses* 4 *and* 5.1.2)

All dimensions in millimetres.



RCMT

RCGT
with chip breakers

Inserts	d[1]	s[1]	d_1 Js 13
RCGT 0602M0	6	2.38	2.8
RCGT 0803M0	8	3.18	3.4
RCGT 1003M0	10	3.18	4.4

[1] Tolerance on *d* and *s* according to IS 9897 (*see* **5.1.1**).

Table 7 Dimensions for Fixing Hole for Inserts

(*Clauses* 5.1.2 *and* 6.2)

All dimensions in millimetres.

***d* for Insert Shape T, S, C, D, V**	3.97	5.56	6.35	7.94	9.525	12.7
***d* for Insert Shape R**	—	—	6	8	10/12	—
d_1 Js 13	2.15	2.5	2.8	3.4	4.4	5.5
d_2 Js 13	2.7	3.3	3.75	4.5	6	7.5

ANNEX A

(*Clause* 5.2)

METHOD OF MEASUREMENT OF DIMENSION '*m*'

(This Annex forms an integral part of the standard)

A-1 TRIANGULAR INSERTS

Dimension *m* is related to the side opposite the corner that is to be measured. The insert is placed on a surface plate as shown in Fig. 3 and checked by means of a dial gauge zeroed with the aid of a gauge block corresponding to dimension *m*. The dial gauge then gives a direct reading of the error when applied to the inserts to be measured.

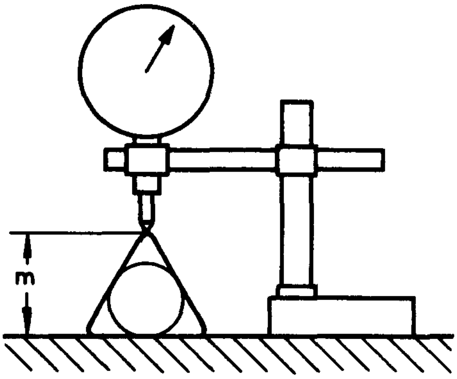


FIG. 3 MEASUREMENT OF TRIANGULAR INSERT

A-2 SQUARE INSERTS

Dimension *m* is checked by reference to the diameter *d* of a precision roller, where *d* corresponds to the nominal diameter of the inscribed circle of the insert. The insert is mounted on a 90° vee-block as shown in Fig. 4 and checked by means of a dial gauge which has been zeroed to dimension *m* by means of a roller with the aid of a gauge block. The dial gauge then gives a direct reading of the error when applied to the inserts to be measured. The roller has a tolerance of ± 0.002 mm

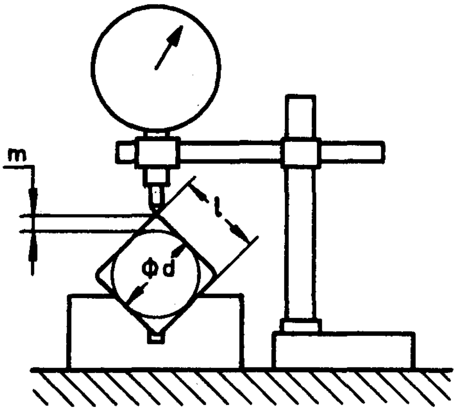


FIG. 4 MEASUREMENT OF SQUARE INSERT

A-3 RHOMBIC INSERTS

Dimension *m* is checked by reference to the diameter *d* of a precision roller, where *d* corresponds to the nominal size of the inscribed circle of the insert. The insert is mounted on a 35°, 55° or 80° vee-block as shown in Fig. 5 and checked by means of a roller with the aid of a gauge block. The dial gauge then gives a direct reading of the error when applied to the inserts to be measured. The roller has a tolerance of ± 0.002 mm.

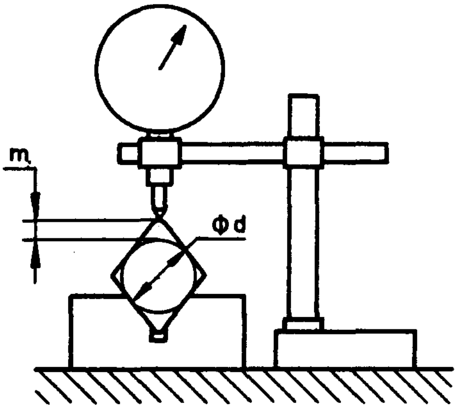


FIG. 5 MEASUREMENT OF RHOMBIC INSERT

A-4 ROUND INSERTS

The diameter *d* is measured with a micrometer or a similar device.

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